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Partnerships in International Applied Epidemiology Training and Service, 1975–2001

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In 1951 the Centers for Disease Control and Prevention created the Epidemic Intelligence Service to provide training and epidemiologic service on the model of a clinical residency program. By January 2001, an additional 28 applied epidemiology and training programs (AETPs) had been implemented around the globe (with over 945 graduates and 420 persons currently in training). Field Epidemiology Training Programs and Public Health Schools Without Walls are the most common models. Applied epidemiologists, or field epidemiologists, use science as the basis for intervention programs designed to improve public health. AETPs train people by providing them with health competencies through providing service to public health intervention programs and strengthening health systems. AETPs are relatively expensive to create and maintain, but they are highly sustainable and can produce immediate benefits. Of the 19 programs that began before 1997, 18 (95%) continue to produce graduates. The Training Programs in Epidemiology for Public Health Interventions Network was organized in 1997 to provide support, peer review, and quality assurance for AETPs. In 2001, new programs are planned or in development in India, Argentina, China, and Russia. *Am J Epidemiol* 2001;154:993–9.

Centers for Disease Control and Prevention (U.S.); competency-based education; education; international cooperation; public health

OVERVIEW

In 1951, the Centers for Disease Control and Prevention (CDC) inaugurated the Epidemic Intelligence Service to strengthen systems for disease detection and response in the United States (1). The Epidemic Intelligence Service continues to use practical apprenticeship-style training to provide service and to train health professionals in applied epidemiology and other public health competencies. During the past 25 years, applied epidemiology training programs (AETPs) have been established in 28 countries as extensions of the Epidemic Intelligence Service model. As of January 2001, AETPs have graduated an estimated 945 public health leaders, and another 420 persons are currently in training (table 1; figure 1). AETPs comprise a global resource for surveillance and interventions to improve health (2, 3). These programs are a source of practical training for young professionals in the detection, surveillance, response, analysis, and prevention services associated with high-priority public health problems. Because trainees function as active staff members of public health service programs, AETPs create a setting in which evidence-based public health systems that serve communities effectively and efficiently can be established.

HISTORY

In 1975, the Canadian government, in consultation with CDC, developed a competency-based training program in field epidemiology that evolved into the Canadian Field Epidemiology Training Program (FETP) (4). Successes of the Epidemic Intelligence Service led to requests to help build the national epidemiologic capacity in many countries. To meet this need, CDC partnered with the World Health Organization and the Kingdom of Thailand in 1980 to establish an FETP modeled on the Epidemic Intelligence Service, which involved assigning a CDC consultant to serve as the in-country technical advisor to the program for several years (1, 5). Subsequently, epidemiologists in ministries of health, in consultation with Epidemic Intelligence Service graduates, established training programs in Asia, the Americas, Australia, Europe, and Africa (table 1) (2–8). Since the mid-1990s, broader models that teach applied epidemiology and other public health competencies have been developed. Although FETPs typically are entirely located in ministries of health, the Public Health Schools Without Walls are partnerships between ministries

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Abbreviations: AETP, Applied Epidemiology and Training Program; CDC, Centers for Disease Control and Prevention; FETP, Field Epidemiology Training Program; TEPHINET, Training Programs in Epidemiology and Public Health Interventions Network.

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TABLE 1. Estimated number of graduates and trainees of selected applied epidemiology training programs as of January 2001*

Country	Program started (year)	Graduates to date (no.)	Current trainees (no.)
Canada	1975	68	11
Thailand†	1980	80	13
Indonesia	1982	50	42
Mexico	1984	111	28
Taiwan	1984	88	22
Philippines	1987	57	12
Peru	1989	39	45
Saudi Arabia†	1989	58	5
Australia	1991	46	13
Colombia	1992	38	7
Italy	1992	6	0
Egypt	1993	22	7
Zimbabwe	1993	33	17
Spain	1994	29	11
Uganda	1994	42	20
European Union† (EPIET‡)	1995	56	9
Hungary	1995	9	0
Cote d'Ivoire	1996	5	5
Germany	1996	7	6
Ghana	1997	77	24
Vietnam	1997	24	42
Jordan	1998	0	7
Japan	1999	0	12
WHO†,‡	1999	0	8
Brazil	2000	0	12
Central America†	2000	0	23
Korea	2000	0	10
India	2001	0	9
Total		945	420

* Excluding the Epidemic Intelligence Service in the United States.
† Provides training for more than one country.
‡ EPIET, European Program for Intervention Epidemiology Training; WHO, World Health Organization.

and universities (9). Both models emphasize competency-based field epidemiology, but the Public Health Schools Without Walls provide broader training in management and social sciences than do most FETPs. The Global Health Leadership Officers Program, headquartered in Geneva within the World Health Organization, is a program that trains participants in field epidemiology and other competencies needed for program management. All of these models are referred to collectively in the sections below as *Applied Epidemiology and Training Programs (AETPs)*.

Since 1986, AETP trainees and staff have participated in annual scientific international conferences that provide a forum for trainees to present papers selected on a competitive basis. These meetings maximize opportunities for the AETP trainees and staff to interact and learn from each other. The sessions were usually conducted in coordination with the CDC Epidemic Intelligence Service conference or the International Clinical Epidemiology Network conferences. These meetings served as a forum for individual programs to share ideas, but there was a growing realization that the programs needed a better way to work together. In June 1997, the Merieux Foundation funded a meeting that was cohosted by the World Health Organization and CDC and was conducted in Annecy, France. During this series of meetings, the Training Programs in Epidemiology and Public Health Interventions Network (TEPHINET) was created. Members and supporters of the network included representatives of the training programs, CDC, and the World Health Organization. The mission of TEPHINET is *to strengthen international public health capacity through supporting, networking, and initiating field-based training programs that enhance competencies in applied epidemiology and public health interventions*. The Training Programs in Epidemiology and Public Health Interventions Network provides a voice for the programs on the global stage and provides a venue for developing shared curriculum, national and regional training programs, and quality assurance. The network also coordinates participation in World Health Organization-sponsored and other multinational outbreak response teams. It also provides technical assistance to improve surveillance, disease prevention, and health promotion programs. In 2000, the Training Programs in Epidemiology and Public Health Interventions Network held its first independent AETP global conference in Ottawa, Canada, which included 50 oral presentations and 44 posters.

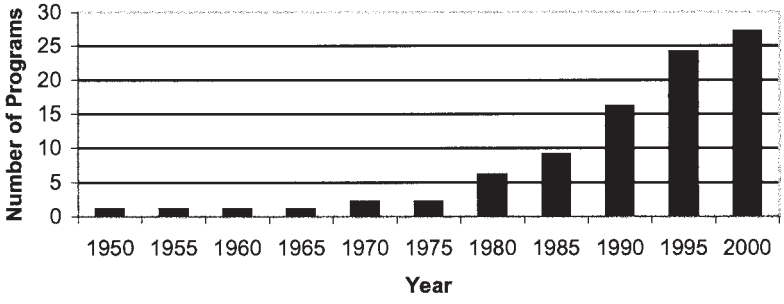

FIGURE 1. Global number of applied epidemiology training programs, 1950–2001.

DEFINITION OF APPLIED EPIDEMIOLOGY AND TRAINING PROGRAMS

Applied epidemiology and training programs are *those programs that build capacity in health service agencies by providing training in field epidemiology and other public health competencies in the context of health service delivery systems*.

As the result of extensive discussion, members of the Training Programs in Epidemiology and Public Health Interventions Network have defined applied or field epidemiology as *the use of epidemiology as a tool to design, evaluate, or improve interventions to protect the health of a population*. Typically, in the context of ministries of health or allied service organizations such as nongovernmental health organizations, applied or field epidemiology is a discipline that identifies and investigates patterns of health and disease in the population served by the organization. The scope and time frame of any study are determined by the need for action and the resources available to be applied to it. The task is not complete until results of a study have been conveyed clearly to those who need to know and an intervention has been implemented to improve the health of the people.

Over the last several years, a vigorous debate has been conducted about the goals of academic epidemiology (10–14). This discussion is less relevant for field epidemiologists because they function in ministries of health to provide epidemiologic service to strengthen program implementations. Because field epidemiologists are intimately involved in providing information needed to target, design, and evaluate intervention programs—and may make the interventions themselves—it is sometimes difficult to distinguish their roles from those of public health managers. Although field epidemiology and competency-based methods are at the core of all AETPs, some newer programs use the terms "public health" or "health leadership" in their titles to emphasize these aspects of their training programs.

ISSUES IN DESIGNING A NEW AETP

An AETP is designed to meet the objectives of the health agency it serves. This design feature is linked inextricably with each program's success and sustainability. In the short term, ministries of health and other health agencies use the training programs to provide services such as surveys and outbreak investigations. In the medium term, the programs build or strengthen organizational units for surveillance or health interventions. Lack of functional information systems is a critical barrier to improving health services, because information on disease occurrence and trends is needed as a basis for targeting and implementing intervention programs and for detecting outbreaks (8, 15, 16). The most common functions that sponsoring health agencies develop through AETPs are health-related information and response systems, especially for disease surveillance and related intervention activities. Agencies also use AETPs to help develop intervention programs. For instance, the FETP staff and graduates in Thailand played a critical role in building the human immunodeficiency virus control program. Another example is provided by the Public Health School Without Walls in Uganda, which assisted in building a high-quality health program management system at the district level.

In the long term, AETPs provide a critical mass of competent, dedicated health workers who strengthen the programs and management of the health system. After an AETP has been in existence for 10–25 years, key officials at the highest levels of the public health system are often graduates (17).

Because each country's public health system has a unique blend of objectives, preexisting capacity, regulations, and corporate culture, each AETP must be designed individually. Although it is admittedly expensive to develop and adapt curriculum to the needs of each country, this approach is critical to ensuring that the program is relevant to that country's public health system and that the governing officials of that public health system feel ownership of the training program.

An AETP should be designed to provide a core of health workers with the competencies to build or strengthen the public health system. This planning phase includes identifying the structural changes, competencies, and funding sources needed for a more effective system. It is a challenge to develop new organizational structures and career paths, and these changes usually occur gradually as ministries of health staff see the utility of the AETP trainees and graduates. Another challenge is to secure funding. The customized curriculum and one-on-one apprenticeship-style training of AETPs are relatively expensive; a new program may cost $160,000–$1.2 million per year (including salaries, supplies, and short-term consultancies). The reason donors and sponsoring health agencies have funded AETPs is that it is clear that the output includes new, functioning components of the health system. For example, if the sponsoring health agency's goal is to build and operate an information system, health workers need to design questionnaires competently, as well as to enter, tabulate, interpret, and report data in the field in a way that is immediately useful to decision makers. The ability to do each of these tasks is a competency. More generally, a public health competency is the ability to perform tasks that are part of implementing health interventions in the context of the public health system (18, 19).

The AETP should be designed to provide the specific competencies needed by the sponsoring agency to build its information system as well as other core public health competencies. Program directors of the Training Programs in Epidemiology and Public Health Interventions Network have agreed on a set of core competencies that address four areas of emphasis: using epidemiology to provide evidence for public health service and using skills in the areas of communications, program management, and professionalism to enhance the quality of public health practice (table 2).

An excellent way to learn to be competent in a complex activity, for example, doing cluster surveys, is to conduct a survey under close supervision to help target or evaluate a program. When trainees have demonstrated that they can successfully perform the activity in the field, they are certified as being competent. This is similar to the process involved in clinical residencies in medicine in which interns and residents learn to perform surgical and other medical procedures under close supervision. This apprenticeship

TABLE 2. Examples of consensus core competencies and activities of the Training Programs in Epidemiology and Public Health Interventions Network

Assess the magnitude and public health importance of actual or potential public health problems
Design scientific investigations that take into account the nature and significance of the problem
Formulate testable hypotheses that reflect knowledge of the problem and an appreciation of research principles and consistent with epidemiologic data and other scientific facts about the disease and its epidemiology
Conduct scientific investigations in epidemiology that are consistent with the developed hypotheses and study design
Interpret results of scientific investigations in a manner that is consistent with the data and relevant study details (e.g., limitations due to study design) and relevant to the public health issue
Recommend logical and practical public health actions that are consistent with the interpretation of the scientific investigation
Prepare written study proposals that are accurate, clear, concise, logical, and thorough
Develop presentations and reports to inform and persuade different audiences (other professionals, decision makers, the public) that epidemiologic findings are important and that the audiences should modify their behavior appropriately
Demonstrate integrity by considering moral and ethical issues during all phases of professional performance
Fulfill professional responsibilities regarding quantity, high quality, and punctuality of work in a manner that reflects motivation, initiative, and creativity
Strive to achieve the highest quality possible in each investigation and should clearly recognize the limitations of each study
Show professional judgment by making decisions and initiating action after a clear and rational consideration of pertinent data and possible consequences
Work calmly under pressure, maintain composure during stressful situations, and adapt to unexpected events in the course of professional activities
Grow in professional role by evaluating own learning needs (through assessing own strengths/weaknesses) and initiating action to meet these needs
Work with resource personnel (e.g., supervisor) to clarify, validate, evaluate, and extend own ideas; integrate constructive suggestions when appropriate
Manage the administrative component of fieldwork
Advocate for resources in order to implement the recommendations derived from the outbreak research

model makes both clinical residencies and AETPs expensive because each trainee requires direct supervision. Demonstrating that each trainee can perform each competency required in a subject area takes time. It takes about 2 years to train competent applied epidemiologists who are able to function independently (20). However, as is the case with residencies, AETP trainees are essential to service provision within the institutions where they work within weeks of starting their training.

Both academic education and competency-based training are important strategies for building capacity for ministries of health. Some of the strongest AETPs represent partnerships between ministries of health and academic institutions. For example, the Australian Master's of Applied Epidemiology program is a collaboration between the Australian National University and government public health service organizations, which combines the strengths of both academic and competency-based models. In the mid-1990s, the Rockefeller Foundation conceptualized Public Health Schools Without Walls, which link ministries of health and universities in several African countries and Vietnam (9).

Academic institutions can provide staff knowledgeable in a broad range of public health disciplines that can allow an AETP to produce more graduates. For example, Public Health Schools Without Walls curricula focus on management, economics, and behavioral sciences as well as epidemiology. Often an academic partner provides a Master's of Public Health or similar degree that is important for recognition of graduates in personnel systems.

IMPLEMENTING AN APPLIED EPIDEMIOLOGY TRAINING PROGRAM

Training in an AETP typically lasts 2 years. It begins with a problem-oriented classroom course that may be as short as 3 weeks or as long as 1 year. Upon completion of this didactic period, trainees immediately move into the field and begin short- and long-term field projects that address their required competencies, as well as specific, expressed needs of their ministries of health.

Trainees typically spend 60–70 percent of their 2-year training period in the field. Field supervisors usually accompany each trainee on his/her first few investigations. This might involve 1–2 weeks of full-time direct field supervision followed by several weeks of part-time supervision for data entry, analysis, and report writing. This process produces evidence and high-quality reports that quickly become part of the ongoing service in the ministry of health. Because major programs may be based on the research, it is essential to have high-quality science and to have that science described in clear, compelling presentations.

When an AETP is beginning, there are few experienced field epidemiologists available to provide mentoring and supervision. This is a major challenge. Usually the most promising staff and field supervisors have demanding jobs, such as District Medical Officer or program manager. Because it is difficult to persuade ministers of health to commit their most productive staff full time to an AETP until they are convinced that the product is useful, new AETP staff can rarely dedicate the time needed for the intensive field supervision. In this situation, a resident external consultant is essential to model the behavior of field epidemiologists and to mentor trainees. The consultant must be an experienced field epidemiologist.

This consultant works under joint supervision of the in-country sponsoring health agency and CDC to assist in developing the program in such a way as to meet the public health system's needs. In addition to modeling behavior and establishing and maintaining a culture of excellence, the consultant usually provides much of the day-to-day program management until graduates of the first cohorts take over these tasks.

AETP graduates from many countries are increasingly acting as the consultants in new programs. The training program in Colombia was started with graduates from the Mexican training program and technical backup from the CDC. The Central America AETP involved graduates of Spain, Colombia, and Peru—with short-term assistance from graduates of the Epidemic Intelligence Service, Mexico and Australia. As more consultants are recruited from AETPs outside CDC, access to technical support from CDC remains an important resource.

Most new AETPs have had a full-time, in-country consultant from CDC for at least the first 2–4 years of operation. Exceptions include the Canadian FETP, the European Programme for Intervention Epidemiology, and the Ghana Public Health School Without Walls.

In most new programs, CDC provides support for strategic planning, fund raising, curriculum and materials design, training of trainers, and field supervision. CDC also provides short-term specialized technical assistance on priority health problems such as malaria, injuries, diabetes, or informatics to both new and established AETPs.

SERVICE DELIVERY

Within weeks of being implemented, AETPs provide service to their sponsoring public health agencies and other partners. The experience of the FETP in the Philippine Department of Health illustrates this service. Starting in 1988, the Philippine FETP developed and implemented ongoing surveillance systems for outbreaks of acute infectious diseases. It later added surveillance for human immunodeficiency virus seroprevalence and behavioral risks, acute flaccid paralysis, and fireworks-related injuries (21, 22). After surveillance revealed outbreaks of tetanus from fireworks-related injuries, the Philippine Department of Health asked the FETP staff to create injury surveillance and intervention programs. Over several years the rate of injuries associated with fireworks fell dramatically, and excess cases of tetanus after celebrations involving fireworks all but disappeared.

In several major disasters, the Philippine Department of Health used the FETP to make rapid surveys to identify the needs of evacuees in order to target aid and determine whether that aid was effective. In one such situation, over 300 people were killed in an earthquake in Baguio. The FETP trainees were among the first to arrive on-site and began daily reports to the Philippine Department of Health within 24 hours. They also conducted a case-control study that identified risk factors for injury and death (23). After the eruption of Mount Pinatubo in 1991, the Philippine Department of Health used the FETP to coordinate active surveillance on the health needs of over 100,000 evacuees and to provide daily reports to disaster managers and the Cabinet (24).

Surveys and outbreak investigations led to improvements in vaccine coverage, changes in the ages for vaccinating more susceptible children, and reassuring the public about vaccine safety (25). The Philippine Department of Health assigned the FETP to do a series of national cluster surveys on nutrition that were used to direct a number of programs for child health. Investigations of cholera, typhoid, hepatitis A, and other waterborne diseases led to repair and reconstruction of water systems and improved sanitation for food vendors (26). When the Reston strain of Ebola virus originated in the Philippines, FETP staff and trainees investigated, determined public health risks, and made recommendations that provided the evidence for policies put in place by the Philippine Secretary of Health (27, 28).

Other AETPs provide services that are similar to those described above. Examples from other countries include the following:

- The Uganda Ministry of Health's response to the Ebola hemorrhagic fever outbreak in 2000–2001 was led and staffed by graduates and staff of the Uganda Public Health School Without Walls (29).
- The FETP in Thailand conducted studies that led to the implementation of measles, hepatitis B, and the human immunodeficiency virus control programs. Many of the national program managers and technical staff are FETP graduates.
- The German FETP established a national surveillance and response system that identified and investigated 27 important outbreaks between 1996 and 1999, including hemolytic-uremic syndrome due to *Escherichia coli* O157:H7 associated with consumption of sausages, Q fever in communities downwind from a sheep farm, and Norwalk-like virus associated with bottled water (8).

SUSTAINABILITY AND INSTITUTIONALIZATION

Excluding the Epidemic Intelligence Service, 19 of the AETPs listed in table 1 have been in existence more than 4 years. Of these 19, almost all (18, or 95 percent) continue to produce graduates, submit abstracts and papers to international conferences, and provide service to their governments. These programs have been sustained because they provide valuable services to their ministries of health both during and after training.

In 1996, CDC commissioned the Battelle Corporation to evaluate CDC's support to AETPs (17). The evaluation assessed the effectiveness of the AETPs in achieving national sustained capacity in applied epidemiology training and public health service. Researchers visited training programs in Mexico, Thailand, the Philippines, Spain, and Uganda and conducted extensive interviews with trainees, staff, and health program managers, political decision makers, and donors. The managers and decision makers reported numerous examples of how information from trainees and graduates was valuable to them in designing and implementing health programs. The AETPs created teams that built functioning parts of the organization that resulted in greater efficiency and effectiveness. Trainees and graduates formed solid networks in the country's health systems, and nearly all of them remain in public health in their home countries. For example, 70 percent of Thailand's graduates are in the Thai Ministry of Health, many in positions of significant responsibility.

Because of the challenges involved in coordinating AETPs and academic programs, most AETPs do not grant degrees, and new AETPs face substantial challenges in persuading government personnel systems to recognize graduates for technical positions. In spite of this, Battelle found that AETPs provide a viable career ladder for national staff as evidenced by the careers of graduates.

QUALITY ASSURANCE

For AETPs to be useful to ministries of health, it is essential that they produce high-quality information based on credible science as judged by decision makers in their countries as well as by other ministries and international organizations. Each year, AETP trainees and graduates present papers during the international night session of CDC's Epidemic Intelligence Service conference. The World Health Organization Communicable Disease Cluster recognizes the contribution of AETPs to providing quality surveillance and response and actively participates in these meetings and other activities of the Training Programs in Epidemiology and Public Health Interventions Network.

AETP staff and trainees regularly publish in national bulletins and peer-reviewed journals. However, many important investigations are not published internationally because of heavy service loads and difficulties with English. While AETPs are applied, not academic, research organizations, there is a clear need to increase publications in international peer-reviewed journals to disseminate important findings, document successes, and identify problems.

The Training Programs in Epidemiology and Public Health Interventions Network can play a much larger role in ensuring and improving quality for AETPs. The network presently has a two-tier membership system, in which full voting membership is only given to programs that agree to teach all of the core competencies. This encourages programs to provide complete training and competency-based certification for their graduates. There is ongoing discussion of developing a formal quality assurance program in the network.

Strong networks with the Centers for Disease Control and Prevention, Training Programs in Epidemiology and Public Health Interventions Network, World Health Organization, local academic institutions, and clinical epidemiology units (networks of epidemiologists and behavioral scientists in medical schools) provide a strong base for building and maintaining high-quality evidence-based public health at the national level.

THE FUTURE

Regional programs provide promising strategies for sharing program costs and for responding to public health problems that do not respect national borders. Many countries need applied epidemiologists, but their population base and financial support do not allow for a separate training program. Regional programs offer a broader set of health challenges, more supervisors, and richer experiences. The Thai FETP offers an international track in which trainees from Laos, Vietnam, and Myanmar visit Thailand for a short didactic course and then return to their countries for fieldwork under a local supervisor with periodic visits from the Thai supervisors. The European Program for Intervention Epidemiology is a consortium that exchanges trainees among European countries (7). Saudi Arabia has been partnering to train staff for the Oman Ministry of Health for many years. In 2000, a regional AETP was established in Central America for seven countries. Such regional pro-

grams face barriers because their members may speak different languages, and public health laws and corporate cultures are different in different countries. It will be important to develop strategies to overcome these challenges.

To serve ministries of health and other components of government more effectively, many AETPs are broadening their focus in two ways. First, programs that usually focus on outbreak investigation and infectious diseases have added noncommunicable diseases and injuries to the curriculum. Second, health officials in developing countries ask their programs to produce public health workers with competencies in management and behavioral sciences as well as in epidemiology.

In the last few years the programs have added more management competencies to the core list (table 2). In addition, the Field Management Training Program, a new initiative of the Philippine FETP, provides training for teams of local government officials and technical health personnel. The Public Health School Without Walls in Zimbabwe plans to implement a similar program in 2001. The challenge will be to maintain excellence in epidemiology while introducing or strengthening new competencies that make the graduates more effective in the context of service organizations.

The number of new AETPs continues to grow (figure 1). In 2001, new programs are planned or under way in the Tamil Nadu state in India, China, Russia, and Argentina. These new programs will add ministries that serve more than half the world's population to the global network of applied epidemiologists. Developing programs to meet these needs will require all the resources that the CDC, World Health Organization, TEPHINET, and partner institutions can provide.

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REFERENCES

1. Thacker SB, Goodman RA, Dicker RC. Training and service in public health practice, 1951–90—CDC's Epidemic Intelligence Service. Public Health Rep 1990;105:599–604.
2. Music SI, Schultz MG. Field epidemiology training programs: new international health resources. JAMA 1990;263:3309–11.
3. Malison M, Dayrit M, Limpakarnjanarat K. The field epidemiology training programmes. Int J Epidemiol 1989;18:995–6.
4. White F. A perspective on the control of communicable diseases in Canada. Can J Public Health 1976;67:449–59.
5. Brandling-Bennett D, Jatanasen S, Maturosapas W, et al. A practical way to train epidemiologists. World Health Forum 1983;4:344–7.
6. Cardenas V, Sanchez C, De la Hoz F, et al. Colombian field epidemiology training program. Am J Public Health 1998;88:1404–5.
7. Moren A, Drucker J, Rowland M, et al. European Program for Intervention Epidemiology Training (EPIET): a training epidemiologic intervention in Europe. Rev Epidemiol Sante Publique 1998;46:533–40.
8. Petersen LR, Ammon A, Hamouda A, et al. Developing national epidemiological capacity to meet the challenges of emerging infections in Germany. Emerg Infect Dis 2000;6:576–84.
9. Bertrand W, Berkley S, Janowski S. The Public Health Schools Without Walls project: new models of public health education. N Y Sci Health 1990;105:599–604.
10. Putting public health back into epidemiology. (Editorial). Lancet 1997;350:229.
11. Kickbusch I. New players for a new era: responding to global public health challenges. Public Health Med 1997;2:171–8.
12. Rothman K, Adami H, Trichopoulas D. Should the mission of epidemiology include the eradication of poverty? Lancet 1998;352:810–13.
13. Beaglehole R, Bonita R. Public health at the crossroads: which way forward? Lancet 1998;351:590–2.
14. Leeuw E. European schools of public health in a state of flux. Lancet 1995;345:1158–62.
15. Cash RA, Narasimhan V. Impediments to global surveillance of infectious diseases: consequences of open reporting in a global economy. Bull World Health Organ 2000;78:1358–66.
16. Rodrigues RJ. Information systems: the key to evidence-based health practice. Bull World Health Organ 2000;78:1344–51.
17. Betts CD, Abed JP, Butler MO, et al. Evaluation of the Field Epidemiology Training Program. Arlington, VA: Battelle Centers for Public Health Research and Evaluation, 1998. (Contract no. 200-96-0599, task 3).
18. Long DM. Competency-based residency training: the next advance in graduate medical education. Acad Med 2000;75:1178–83.
19. Lane DS, Ross V, Chen DW, et al. Core competencies for preventive medicine residents: version 2.0. Am J Prev Med 1999;16:367–72.
20. Thacker S, Buffington J. Applied epidemiology in the 21 century. Int J Epidemiol 2001:30:320–5.
21. White ME, McDonnell S. Public health surveillance in low and middle income countries. In: Teutsch SM, Churchill RE, eds. Principles and practice of public health surveillance. 2nd ed. New York, NY: Oxford University Press, 2000.
22. Sutter RW, Cochi SL. Comment: ethical dilemmas in worldwide polio eradication programs. Am J Public Health 1997;87:913–16.
23. Roces MC, White ME, Dayrit MM, et al. Risk factors for injuries due to the 1990 earthquake in Luzon, Philippines. Bull World Health Organ 1992;70:509–14.
24. Surmieda MR, Lopez JM, Abad-Viola G, et al. Surveillance in evacuation camps after the eruption of Mt. Pinatubo, Philippines. MMWR CDC Surveill Summ 1992;41(SS-4):9–12.
25. Catindig N, Abad-Viola G, Magboo F, et al. Tetanus toxoid and spontaneous abortions: is there epidemiological evidence of an association? Lancet 1996;348:1098–9.
26. Lim-Quizon MC, Benabaye RM, White FM, et al. Cholera in metropolitan Manila: foodborne transmission via street vendors. Bull World Health Organ 1994;72:745–9.
27. Miranda ME, White ME, Dayrit MM, et al. Seroepidemiological study of filovirus related to Ebola in the Philippines. Lancet 1991;337:425–6.
28. Miranda ME, Ksiazek TG, Retuya TJ, et al. Epidemiology of Ebola (subtype Reston) virus in the Philippines, 1996. J Infect Dis 1999;179(suppl 1):S115–19.
29. From the Centers for Disease Control and Prevention. Outbreak of Ebola hemorrhagic fever—Uganda, August 2000–January 2001. JAMA 2001;285:1010–12.